GEOMORPHOLOGY AND GROUNDWATER edited by A. G. Brown, John Wiley & Sons, Chichester, 1995. No. of pages: viii + 213. Price: £45.00 (hb). ISBN 0-471-95754-2.

This book's title can be read in several ways. Obviously, it was the editor's aim (for this is not a volume conceived by a single author but, alas, an edited collection of papers) to illuminate the shady region between the well-tilled fields of geomorphology and hydrogeology. From this it follows that one way of regarding its contents is to examine how the concerns of geomorphology – the study of landforms and their origins — are advanced by a knowledge of hydrogeology. What role does groundwater play in the origin of landforms? Equally, one might ask the reverse question: how does knowledge of an area's geomorphology enhance our understanding of groundwater flow and conditions? Despite a brave attempt in Chapter 1 to show how the later chapters fit these two viewpoints, the book as a whole does not cover either of them. Some of the ten contributions are on geomorphology. Others are on groundwater. Very few are on both.

It is fair to ask what the role of geomorphology should be in thinking about groundwater. The shape of the land and its topographic gradients drives most groundwater flow. An accurate description of the landscape is as essential to the definition of a problem in hydrogeology as is description of the underlying geological structure. The land surface may, therefore, be viewed as part of the boundary conditions of groundwater flow. But simple descripion of what is there has no time dimension, and is very partial and simplistic. It is best expanded by considering the role of geomorphic processes in determining aquifer properties (permeability, porosity and so on) and aquifer geometry. The most obvious examples are in alluvial aquifers where the geomorphic history of a river valley is reflected in both the geometry of terraces and deposits, and in the grain sizes and sedimentary bodies that determine aquifer properties. Alas, the four chapters in this book that deal with alluvial aquifers show almost no awareness of the influence of geomorphic history. All are excellent studies of groundwater occurrence and dynamics and all could easily have been published in journals on hydrogeology. But none contains any intellectual linkage between groundwater and geomorphic history.

The converse question can also fairly be asked – what is the role of groundwater in geomorphology? I would give three answers. Firstly, groundwater flow and chemical interactions with rock and soil are important geomorphic processes involved in weathering. In fact, through the production of weathered regolith, which is itself an important aquifer for local water supply, this process feeds back to the role of geomorphic process in hydrogeology. Secondly, some specific landforms owe their origin exclusively or partly to weathering and erosion by groundwater. For karst caves, groundwater erosion alone is a sufficient cause, while for forms such as box canyons, soil pipes and gullies and many karstic dolines, groundwater flow or erosion by groundwater are necessary, but only contributory causes. Finally, groundwater dynamics may exert a subtler influence on landscape as a whole, for example through their determining influence on the drainage density of perennial streams, which results from the interaction of climate in determining hydrological surplus, and aquifer permeability in determining the geometry of water tables in the vertical plane.

Such considerations were at the centre of two previous compilations on geomorphology and groundwater (LaFleur, 1984; Higgins and Coates, 1990). They are addressed in one of the best contributions to the present volume, in which McFarlane and colleagues discuss the origin and evolution of clay-filled closed depressions in northern Australia, demonstrating that they are intimately related both to long-term landscape development and to shorter-term changes in groundwater dynamics and regolith leaching. Other chapters also show a concern for the role of groundwater in landscape development, but are weakened by the fact that this is not their central focus. Hardwick and Gunn give a straightforward account of karst hydrogeology in the area around a polje-like feature in South Wales, but without attempting to interpret its origin. Younger and Stunell demonstrate that groundwater processes are important in producing tafoni and caves in sandstones in the north of England, but spiral off into discussing the origin of solution runnels and the definition of karst, which is interesting but irrelevant given the book's title.

Two contributions attempt to take a holistic view of hydrogeologic systems as parts of landscapes, with special reference to groundwater development schemes and their possible environmental impact. Of these, Burke's contribution on large-scale hydrogeological provinces in Sudan contains much interesting information. However, real intellectual excitement was generated (at least for me) by Carter's study of groundwater and the potential consequences of development in a dunefield in the Sahel. Cycles of salinization and vegetation change produced by groundwater evaporating from inter-dune hollows are elucidated, albeit speculatively, and the possible consequences of uncritical tubewell development are discussed. Nevertheless, though interesting, this is not a central concern of geomorphology.

Why publish this collection of papers as a book? The answer, I fear, lies in its origin in a symposium. Symposia that aim to explore the boundaries between disciplines are inevitably hit-or-miss affairs. Sometimes they work, sometimes they don't, and what may have been an illuminating discussion on the day can turn into a jumble of

poorly connected papers in a multi-authored proceedings. The papers in this book might have been better published in journals. I think the answer to the question, why publish a book?, lies more in the commercial dynamics of publishing than in any intrinsic merit of books as vehicles for interdisciplinary ideas. Books should have clear threads running through them. By their nature, they can offer extended treatment of a subject in depth. This book has neither. There are too many symposium volumes like it: publishers, please note.

REFERENCES

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ENVIRONMENTAL HYDROLOGY edited by Vijay P. Singh, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1995. No. of pages: 479. Price: $259.00, £161.00. ISBN 0-7923-3549-X.

This book has an intriguing title. All hydrologists, whether they study the physics, chemistry or biology of water, might consider themselves to be studying the 'environmental' science of water. The first chapter makes an excellent attempt at defining the title and the scope of environmental hydrology, although one is left with the impression that the book might just have easily been entitled 'water quality'. Environmental hydrology is defined as 'the science dealing with space–time variability of water quality and its evolution in the hydrosphere, in streams, in lakes, in soil as well as in the lithosphere'. This opening chapter then promotes the ideals of integrated water management, which is to be applauded and supported. Nobody, surely, would argue that this is not the way forward for water resources management, and if environmental hydrology will provide the necessary tools to achieve integrated water management, the following chapters promise much.

The hope and expectation after turning the final page of Chapter 1 were that the bulk of the text would help provide an understanding of the myriad interconnections and internal/external influences on water quality. The book has chapters on river hydrology, solutes in surface waters, water and contaminant transport in the vadose zone, preferential flow of waters and solutes in the vadose zone, and groundwater quantity and quality modelling. These form the basis of the science, and might have been expected to form a set of sequential chapters following the introduction. Since the title of each of these chapters has in the past been used as that for an entire reference book on the subject, I had hoped for an emphasis on the basin-scale relevance of surface and groundwater quality and quantity, and on the important interactions between various water and solute pathways and sources. But no, each chapter attempts to cover the entire subject area. Some aspects are covered in detail, and some are built from basic science to advanced equations, but many others are skimmed over and require a detailed knowledge of background material. This is definitely not a book for the non-specialist, but even for the specialist, it is an opportunity lost.

Other chapters, apparently randomly arranged within the book, cover acidic deposition, climate change, modelling subsurface transport of micro-organisms, nutrient loads, modelling water quality, and ecohydrological impacts. These all make for good case studies of aspects of environmental hydrology. It is a mystery why the acid deposition chapter is placed before chapters describing hydrological and chemical processes. It is also hard to determine the context of the section on climate change, well written though it is.

On the whole, this book is an interesting collection of chapters on subject areas which are related. It could have focused attention on the linkages between these areas, but sadly it does not. Each chapter is well written and the book is nicely produced. The editor is to be applauded for trying to promote a more integrated approach to water quality, but the book fails to stimulate new thinking on how to approach the problems of water quality and integrated management.

As to whether it is worth the asking price, perhaps a hi-fi analogy would be appropriate. Is it better to choose a single-branded system which looks stunning, but which has some poor quality components (say the amplifier or tuner)? Or is it better to mix and match components based upon their individual quality, which do not look so elegant on the shelf but sound better and can be put together within the overall budget of the alternative system? Most music-lovers would probably choose the latter.

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